

# BERYLLIUM-ASSOCIATED WORKER PROGRAM



# Objectives

- ◆ **How did I get here?**
- ◆ **What is beryllium?**
- ◆ **Health effects of beryllium exposure**
- ◆ **OSHA, DOE and Fermilab Standards**
- ◆ **Who and what is ORISE?**
- ◆ **What do I need to do?**
- ◆ **Additional Help**



# How Did I Get Here?

- ◆ Historical Sampling Records
- ◆ Website Beryllium-Associated Worker Questionnaire



# Fermilab Training Programs



- ◆ Beryllium-Associated Worker Training
- ◆ Beryllium Handling Training
- ◆ Beryllium Worker Training

# What is Beryllium?

- ◆ From a toxicity standpoint, Beryllium is defined as any object that contains greater than or equal to 0.1% beryllium
- ◆ Includes beryllium, beryllium alloys, and ceramic beryllia
- ◆ Beryllium is handled in bulk form only - no cutting, sanding, or grinding occurs on site

# Properties of Beryllium

- ◆ Hard silver-gray metal
- ◆ 1/3 lighter than aluminum
- ◆ 6 times stiffer than steel
- ◆ Good corrosion resistance
- ◆ High Melting Point
- ◆ Toxic
- ◆ Radiation shielding properties and Neutron Source

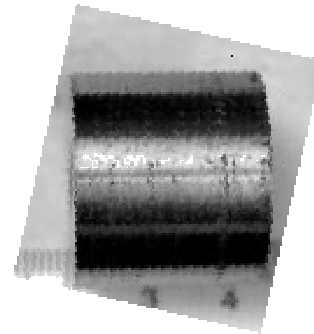


# Sources of Beryllium at FermiLab

- ◆ Beam Targets
- ◆ Beam Pipes
- ◆ Beam Windows
- ◆ Support Structures for Detectors



Beryllium Target



Beryllium Window



# Health Effects



- Skin Disorders
- Lung Disease



# Skin Contact

- ◆ Water soluble beryllium salts can cause skin irritation also called Dermatitis
- ◆ If beryllium is imbedded in the skin, ulcers and corn-like lesions can develop
- ◆ Skin disorders usually heal completely

# Inhalation - Primary Concern

- ◆ Inhalation of small particles
- ◆ Reach into the air sacs of the lung
- ◆ Lung has a mechanism to remove particles
- ◆ Problem occurs when:
  - Can not remove particles as quickly as they are inhaled
  - Allergic reaction occurs

# Acute Beryllium Lung Disease

- ◆ Caused by inhalation of very high levels of beryllium dusts
- ◆ May occur 2 weeks after exposure
- ◆ Symptoms are similar to those of bronchitis or pneumonia
- ◆ Symptoms disappear after exposure ends
- ◆ Rarely occurs today

# Chronic Beryllium Disease

- ◆ Can occur when:
  - Inhale small concentrations of beryllium over a certain time period
  - AND the individual has become sensitized (allergic) to beryllium

# Two Stages of CBD

- ◆ Sensitization - allergic development
  - 3 - 10% of the population
  - Granuloma development
  - Lung tissue irreversibly scarred
  - Reduces ability of lung tissue to transfer oxygen to blood

# Symptoms

- ◆ Coughing
- ◆ Shortness of breath
- ◆ Fatigue
- ◆ Blood in mucus
- ◆ Chest and joint pain
- ◆ Rapid heart rate
- ◆ Loss of appetite
- ◆ Fevers and night sweats

# Chronic Beryllium Disease

- ◆ Medical tests can determine if individuals are sensitized to beryllium
- ◆ Symptoms can occur 5-10 years after exposure
- ◆ No cure exists, but treatments are available
- ◆  $\leq 3\%$  mortality rate



# Lung Cancer



- ◆ Listed by OSHA as potential cancer hazard
- ◆ Research continues



# OSHA Exposure Limits

- ◆ Risk depends on
  - Concentration
  - Frequency
  - Duration
- ◆ 8 hour time weighted average -  $2 \mu\text{g}/\text{m}^3$
- ◆ 15 minute ceiling concentration limit -  $5 \mu\text{g}/\text{m}^3$
- ◆ 30 minute acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift may be  $25 \mu\text{g}/\text{m}^3$
- ◆ These limits have reduced but not eliminated the incidence of CBD



# Department of Energy



- ◆ Many question the adequacy of OSHA's limits
- ◆ All DOE contractors must have a Chronic Beryllium Disease Prevention Program
- ◆ Full program implementation by January, 2002

# Chronic Beryllium Disease Prevention Program

- ◆ Reduction and minimization of exposures
- ◆ Exposure monitoring
- ◆ Medical surveillance
- ◆ Facility characterization and sampling
- ◆ Hazard analysis
- ◆ Recordkeeping
- ◆ Training
- ◆ Performance feedback

# FermiLab's Program

- ◆ FermiLab Environment, Safety and Health Manual, Chapter 5052.5
- ◆ [www-esh.fnal.gov/FESHM/5000/5052\\_5.html](http://www-esh.fnal.gov/FESHM/5000/5052_5.html)

# Definitions (FESHM Chapter 5052.5)

- ◆ Action Level: concentration of airborne beryllium which prompts series of requirements. This is an eight hour time weighted average of **0.2ug/m<sup>3</sup>**
- ◆ Beryllium Worker: a current worker who is regularly employed in a beryllium activity
- ◆ Beryllium Activity: means an activity that has the potential to expose workers to airborne beryllium above detectable limits. Activities include, but are not limited to, cutting, grinding, sanding, and soldering.

# Definitions (FESHM Chapter 5052.5)

- ◆ Beryllium Area: Area where concentration exceeds the Action Level
- ◆ Beryllium Article: manufactured item formed to a specific shape or design during manufacture, that has end use functions that depend in whole or in part on its shape or design during end use, and that does not release beryllium or otherwise result in exposure to airborne concentrations above detectable limits of beryllium under normal conditions of use.

# Definitions (FESHM Chapter 5052.5)

- ◆ **Beryllium-associated worker:** means a current worker who is or was exposed or potentially exposed to airborne concentrations of beryllium above detectable limits, including:
  - A beryllium worker;
  - A current worker whose work history shows that the worker may have been exposed to airborne concentrations of beryllium.
  - A current worker who exhibits signs or symptoms of beryllium exposure; and
  - A current worker who is receiving medical removal protection benefits.



# Inventory



- ◆ Includes current beryllium locations and operations
- ◆ Maintained by Divisions and Sections. A master inventory is also maintained in ESH Section



# Locations and Activities

Facility	Location	Job Description
Beams Division	A-0, C-0, Main Injector	Handling Vacuum Windows
Beams Division	AP-0, NuMI	Handling Beryllium Targets
Beams Division	A-0	Beryllium Beam Tube Pressure Testing
Computing Division	FCC3	Assembly of Portcards
Particle Physics Division	SiDet	Be HDI, Vacuum laminations and assembly
Particle Physics Division	ME-7 Worm	Storage
Particle Physics Division	CDF and DO	Beam pipe installation
Technical Division	MP 9	CMS Muon detector assembly

# Storage and Labeling

- ◆ Label
  - Areas where exposure may exceed action level
  - Beryllium-containing materials
- ◆ Store in dry, designated storage areas
- ◆ Containers must be sealed and secured

# Beryllium Area Label

RESTRICTED AREA - NO ENTRY

**DANGER**

BERYLLIUM WORK AREA

INHALATION OF DUST OR FUME MAY  
CAUSE SERIOUS LUNG DISEASE

POTENTIAL CANCER HAZARD

NO SMOKING OR EATING

CONTACT \_\_\_\_\_ PRIOR TO ENTRY

# Beryllium Hazard Label

## Caution: Beryllium

Dust and fume may cause rashes and ulcers on cut skin.

Suspect cancer hazard. Inhalation of dust or fume can cause lung damage.

Allergic reaction is possible.

Work which may cause exposure to dust or fume must be cleared with  
ES&H Group.

Only beryllium trained workers may use this material.

If contacted, rinse area with water. If inhaled call Medical. Use gloves  
when handling this material.

# Special Responsibilities

- ◆ Division/Section heads must be aware of materials, operations, and related hazards
- ◆ Supervisors, coordinators, and task managers must conduct operations in a safe manner
- ◆ Beryllium workers must have knowledge and training
- ◆ Medical Department must provide medical surveillance program for beryllium workers

# Medical Department Requirements

- ◆ Determine if transferred workers were included in the Beryllium Registry at the previous site.
  - The SOMD will contact the SOMD at the previous site to obtain the old identification number
  - Advise the transferees to identify themselves as a beryllium-associated worker to the new SOMD upon arrival at the new site.
- ◆ Medical Surveillance
- ◆ Medical Surveillance-Related portion of Registry

# Medical Surveillance

- ◆ Baseline and Periodic Medical Evaluation
  - Medical and Work History
  - Respiratory Systems Questionnaire
  - Physical Exam
  - Chest X-ray (Every 5 years)
  - Spirometry Test
  - Beryllium Lymphocyte Proliferation test (BeLPT)
  - Other tests deemed appropriate by physician (Lung Biopsy)
- ◆ Beryllium Workers – Annually
- ◆ Beryllium Associated Workers – Every 3 years

# Beryllium LPT

- ◆ Beryllium lymphocyte proliferation test (BELPT)
  - Tests lymphocytes (white cells) from blood sample
  - Expose lymphocytes to beryllium and measure growth
  - Rapid growth (proliferation) is a positive or abnormal test
  - Two positive tests: DOE considers you SENSITIZED to beryllium





# Other Medical Surveillance Provisions



- ◆ No cost to employee
- ◆ Multiple Physician Review
- ◆ Sharing of Results
- ◆ Alternate Physician determination
- ◆ Written Medical opinion and recommendation
- ◆ Medical Removal

# And Still More Provisions

- ◆ Medical consent
  - Provide employee with summary of medical surveillance program
    - The type of data to be collected
    - How the data will be collected
    - Purpose of collecting the data
    - How data will be protected
  - Provide employee of the benefits and risks
  - Obtain employee signature
- ◆ Counseling and Worker's Compensation

# ORISE

- ◆ Oak Ridge Institute for Science and Education
- ◆ Center for Epidemiologic Research
- ◆ Oversees Medical Surveillance for **Former** Beryllium-Associated Workers
  - Over 20,000 former workers screened to date
    - 184 individuals (~0.9%) have developed CBD
    - 637 individuals (~3.2%) have been determined to be sensitized

# Participating Sites

- ◆ Ames Laboratory
- ◆ Argonne National Laboratory
- ◆ Brookhaven National Laboratory
- ◆ Fermilab
- ◆ Fernald
- ◆ Hanford
- ◆ INEEL
- ◆ Iowa Army Ammunition Plant
- ◆ Kansas City Plant
- ◆ Knolls Atomic Power Lab
- ◆ Lawrence Livermore Nat. Lab
- ◆ Los Alamos Nat. Lab
- ◆ Mound
- ◆ Nevada Test Site
- ◆ Oak Ridge K-23
- ◆ Oak Ridge National Laboratory
- ◆ Oak Ridge Y-12
- ◆ Pantex
- ◆ Rocky Flats
- ◆ Savannah River Site
- ◆ Stanford Linear Accelerator

# What Do I Need to Do?

- ◆ Understand the activities and hazards associated with beryllium
- ◆ Report any signs or symptoms of beryllium exposure immediately
- ◆ Contact supervisor and/or ESH Group if you have any questions or concerns
- ◆ Contact Medical Department for Follow-up

# Additional Help

- ◆ Division/Section Industrial Hygiene
- ◆ Division/Section Senior Safety Officer
- ◆ ESH Section
- ◆ Medical Department
- ◆ ESH FESHM Chapter 5052.5
- ◆ Other Internet Sites

# Summary

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